

REMARKS

By the above amendment, Applicants have amended previously added Claim 18 to define the invention more particularly and distinctly so as to overcome the technical rejections and define the invention over the prior art.

Claim Rejections – 35 USC § 102

The rejection of claims 2, 3, 5-11, 14-16 and 18 under 35 U.S.C. §102(b), as being anticipated by Hockman Re 30,027 is respectfully traversed.

Independent claim 18 has been amended to narrow its scope as well as more particularly point out and distinctly claim the subject matter of the invention in a patentable manner.

Particularly, currently amended independent claim 18 recites reflective surfaced reflecting and directing the incident radiant energy **by means of a single reflection** through spaces between adjacent pairs of “said rear longitudinal ends”. The same applies to dependent claims 2-17.

In claim 18, the term “immediate” has been deleted as unnecessary.

In claim 2, the term “all” has been added to explicitly recite the limitation of reflecting all rays from the light source at angles between 45 and 90 degrees, as pointed out by the Examiner.

The last O.A. stated (p. 2) regarding claims 18 that Hockman shows in Fig. 5 an apparatus for collecting radiation including an array of spaced apart, concave reflectors (16) with rear ends thereof being inclined toward each other, wherein energy which impinges upon the reflectors converged through spaces between adjacent reflector rear ends.

Applicants respectfully submit that claim 18 distinguishes over Hockman under Section 102 because Hockman does not teach the limitation of a **single reflection** on “elongated reflective surfaces” having “generally concave transversal profiles” and being operable to reflect the incident radiant energy into a **plurality of convergent beams** and direct “said plurality of said convergent beams” to a **plurality of converging directions** through spaces between adjacent pairs of “said rear longitudinal ends”.

The Examiner has argued (p. 4) that multiple beams shown in Hockman fig. 5 clearly converge on the energy receiving means (20) and that there are multiple beams incident or converging upon the receiving means (20) which come from the concave reflectors.

Applicants submit that Hockman shows a plurality of known reflectors and teaches how to collect incident solar radiation using a combination of concave and convex reflective surfaces. Particularly, the reflectors (see Figs. 4 and 5 in Hockman) are generally positioned so that the adjacent pairs of concave and convex surfaces act as light guides using multiple reflections at all incident angles. As a matter of optics, an incident beam, once reflected from a convex surface at any incidence angle, becomes divergent. Furthermore, any beam undergoing multiple reflections from a concave surface and an adjacent concave surface will generally also become divergent.

Applicants position **at least a substantial part** of concave surfaces in such a way that the incident energy is reflected only once before it is directed to a "receiving means" through spaces between adjacent surfaces. It will also be appreciated that, as Claim 18 clearly recites, these concave surfaces are operable to form multiple **convergent** beams each being directed to a plurality of **converging** directions. Thus, Hockman does not teach the limitation and useful feature of the present invention of using only convergent fluxes to illuminate the energy receiver using a single reflection and thus improving the energy collection efficiency.

The last O.A. stated (p. 4) that the present claims do not preclude plural reflections from the same reflector. Applicants respectfully submit that Claim 18, as currently amended, clearly recites directing "a plurality of convergent beams" **by means of a single reflection** through spaces between adjacent pairs of the rear longitudinal surface ends. Thus, independent Claim 18 and dependent claims 2-17 preclude any multiple reflections from the same reflector.

The last O.A. also stated that the present claims do not preclude the addition of other elements in the device of Hockman, such as the convex reflector (22). Applicants argue that, for the reasons stated above, the present claims preclude multiple reflections and thus preclude the addition of the convex reflector. Please note that Claim 18 further recites "energy receiving means" positioned so that the convergent energy beams reflected from "said reflective surfaces" at least partially superimpose on "said energy receiving means". Clearly, by adding a convex reflector to intercept incident rays which will otherwise miss the receiving helicoidal tube, Hockman teaches away from using a single

reflection for directing the incident energy to a receiver. It should also be noted that a convex reflector, such as that shown in Hockman, generally forms a divergent beam. Furthermore, Hockman does not teach positioning the convex reflector to direct the incident flux to a plurality of converging directions through spaces between longitudinal ends of adjacent reflective surfaces.

When Hockman positions his curved reflective surfaces, he considers multiple reflections from the same reflector (16), reflective surfaces of adjacent reflectors (one surface being concave and the other being convex) and a convex radiation reflector (22) mounted below the heliocoidal fluid-bearing tube (20) for most of the incident rays and for all incident angles (see Fig. 5). Therefore, he cannot avoid the loss of incident energy inherent to multiple reflections. He does not consider nor is he aware of positioning at least a substantial part of concave reflective surfaces to direct the incident radiation to a receiver through spaces between adjacent longitudinal surface ends by means of a single reflection.

Applicants thank to the Examiner's arguments regarding the limitation of reflecting **all** rays from the light source at angles between 45 and 90 degrees (p. 4, last paragraph). Applicants submit that Claim 2, as currently amended, adds the term "all" to more distinctly recite this limitation. Particularly, Claim 2 defines the slopes of "all said reflective surfaces" being such that angles of incidence α of said radiant energy on "said reflective surfaces" have particular values more than 45° and less than 90° . As a matter of optics, the angle of specular reflection is always equal to the angle of incidence. Thus, the claim defines the reflection angles being between 45 and 90 degrees for all reflective surfaces.

The last O.A. stated that there are portions of Hockman's reflectors which satisfy the requirement of $\beta < 90^\circ$. Applicants submit that dependent claim 11 recites the limitation of energy receiving means being positioned according to a relation: $\beta < 90^\circ$ where β is an angle between the direction to source of said radiant energy and direction to a point at said reflective surfaces taken at a point of the energy receiving surface of said energy receiving means. This limitation, in combination with novel and useful features of independent Claim 18 is also novel and unobvious.

Thus applicants submit that independent claim 18 recites novel physical features, which, in combination, create a new system for collecting and converting radiant energy and hence is patentable under § 102 over Hockman.

Dependent claims 2-17 incorporate all subject matter of claim 18 and add additional matter which, in combination with novel features of claim 18, makes them a fortiori and independently patentable over Hockman.

Thus, for the above reasons, applicants request reconsideration of the rejection of independent claim 18 and dependent claims 2,3,5-11 and 14-16, under 35 U.S.C. 102.

Claim Rejections – 35 USC § 103

The rejection of claims 4 and 17 as being unpatentable under 35 U.S.C. §103(a) over Hockman and claims 12 and 13 as being unpatentable under 35 U.S.C. §103(a) over Hockman in view of Cornwall et al of record 5,180,441 is respectfully traversed.

As stated above, claim 18 has been amended to define patentably over Hockman. Also applicants submit that the novel physical features of claim 18 are also unobvious and hence patentable under §103 since they produce new and unexpected results over Hockman and Cornwall. Dependent claims 4, 17, 12 and 13 incorporate all the subject matter of claim 18 and add additional matters which, in combination with novel features of claim 18, makes them a fortiori and independently patentable over Hockman and Cornwall, or any combination thereof.

Particularly, claim 4, as amended, adds one or more planar reflective surfaces to the apparatus of new claim 18. While planar reflectors are well known in the art, no other references, including Hockman, show them in combination with “reflective surfaces” having generally “concave transversal profiles” and operating in the most efficient manner to collect and convert radiant energy.

Claim 17, as amended, further adds an “axle support means”. Similarly, while tracking devices are widely used in connection with energy collectors, this subject matter in combinations with novel features of new claim 18 creates new and unobvious results, particularly, improved energy concentration and collection.

Claim 12 and dependent claim 13 further add “at least one photovoltaic cell” to the apparatus of new claim 18. Accordingly, with new claim 18 being unobvious and patentable over Hockman, these dependent claims are independently patentable under §103(a) over Hockman in view of Cornwell.

Conclusion

In view of all the foregoing reasons, applicants respectfully submit that the claims are now in the proper form and this application is in condition for allowance, and such allowance is therefore requested.

Respectfully submitted,



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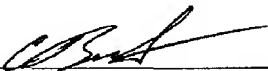
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